



MI715

MO705

MADI Converters

Installation Manual

Document Revision: A







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Regulatory and Safety Notices

Warnings and Cautions

-  Never install equipment if it appears damaged.
-  Disconnect the power cord before servicing unit.
-  Only perform the services explicitly described in this document. For services or procedures not outlined in this document, speak with authorized Avid service personnel.
-  Follow all warnings and cautions in the procedures.
-  Operate the device within its marked electrical ratings and product usage instructions.
-  If you need to replace a battery in an Avid hardware unit, be sure to use the correct battery type. There might be a risk of explosion if a battery is replaced by an incorrect type. Dispose of used batteries according to the manufacturer's instructions.

FCC Notice

Part 15 of the Federal Communication Commission Rules and Regulations has established Radio Frequency (RF) emission limits to provide an interference free radio frequency spectrum. Many electronic devices produce RF energy incidental to their intended purpose.

These rules place electronic equipment into two classes, A and B, depending on the intended use.

Class A devices are those that may be expected to be installed in a business or commercial environment. Class B devices are those that may be expected to be installed in a home or residential environment. The FCC requires devices in both classes to be labeled with the interference likelihood and additional operating instructions. The rating label on the equipment will show which class the product is (A or B). Class A product will not have an FCC logo. Class B equipment will have an FCC logo. The information statements differ on the two classes.

Class A Equipment

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at personal expense.

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Modifications

The FCC requires the user to be notified that any changes or modifications made to Avid hardware that are not expressly approved by Avid Technology may void the user's authority to operate the equipment.

Cables

Connections to Avid hardware must be made with shielded cables with metallic RFI/EMI connector hoods in order to maintain compliance with FCC Rules and Regulations.

PRODUCTS WITH MULTIPLE POWER INPUTS:

WARNING: Each power input is intended to be connected to a separate branch circuit. Risk of high leakage exists if multiple inputs are connected to a single source and protective earth is not present. A QUALIFIED SERVICE PERSON shall verify that each socket-outlet from which the equipment is to be powered provides a connection to the building protective earth. If any do not provide this connection, the QUALIFIED SERVICE PERSON shall arrange for the installation of a PROTECTIVE EARTHING CONDUCTOR from the separate protective earthing terminal to the protective earth wire in the building.

Canadian ICES-003

Class A Equipment

This Class A digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

European Union Declaration of Conformity



Declaration of conformity

Konformitätserklärung

Déclaration de conformité

Declaración de Confomidad

Verklaring de overeenstemming

Dichiarazione di conformità

We/Wir/ Nous/WIJ/Noi:

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European Contact: Nearest Avid Sales and Service Office or

Avid Technology International B.V.

Sandyford Industrial Estate

Unit 38, Carmanhall Road

Dublin 18, Ireland

declare under our sole responsibility that the product,

erklären, in alleniniger Verantwortung, daß dieses Produkt,

déclarons sous notre seule responsabilité que le produit,

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declaramos, bajo nuestra sola responsabilidad, que el producto,
verklaren onder onze verantwoordelijkheid, dat het product,
dichiariamo sotto nostra unica responsabilità, che il prodotto,

Product Name(s) : MADI Converters

Model Number(s): MI715 & MO705

Product Options: This declaration covers all options for the above product(s).

to which this declaration relates is in conformity with the following standard(s) or other normative documents.

auf das sich diese Erklärung bezieht, mit der/den folgenden Norm(en) oder Richtlinie(n) übereinstimmt.

auquel se réfère cette déclaration est conforme à la (aux) norme(s) ou au(x) document(s) normatif(s).

al que se refiere esta declaración es conforme a la(s) norma(s) u otro(s) documento(s) normativo(s).

waarnaar deze verklaring verwijst, aan de volende norm(en) of richtlijn(en) beantwoordt.

a cui si riferisce questa dichiarazione è conforme alla/e seguente/i norma/o documento/i normativo/i.

The requirements of the European Council:

Safety: Directive 2006/95/EC

EN 60065:2002 /A1:2006

EMC: Directive 2004/108/EC

EN 55103-1:1996

EN 55103-2:1996

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LED Safety Notices



Avid hardware might contain LED or Laser devices for communication use. These devices are compliant with the requirements for Class 1 LED and Laser Products and are safe in the intended use. In normal operation the output of these laser devices does not exceed the exposure limit of the eye and cannot cause harm.

Standard to which conformity is declared: (IEC 60825-1)

Optical connections are located on the rear panel and are typically labeled "Optical" or "SPDIF/ADAT." The exact location of optical connections is identified more clearly elsewhere in the documentation for the Avid hardware device.



Use of controls and/or adjustments or the performance of procedures other than those specified herein and elsewhere in documentation for the Avid hardware might result in hazardous radiation exposure.

Disposal of Waste Equipment by Users in the European Union



This symbol on the product or its packaging indicates that this product must not be disposed of with other waste. Instead, it is your responsibility to dispose of your waste equipment by handing it over to a designated collection point for the recycling of waste electrical and electronic equipment. The separate collection and recycling of your waste equipment at the time of disposal will help conserve natural resources and ensure that it is recycled in a manner that protects human health and the environment. For more information about where you can drop off your waste equipment for recycling, please contact your local city recycling office or the dealer from whom you purchased the product.

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Rack-mount Requirements

The following rack-mount requirements are listed below:

- **Elevated Operating Ambient** — If installed in a closed or multi-unit rack assembly, the operating ambient temperature of the rack environment might be greater than room ambient. Therefore, consider installing the equipment in an environment compatible with the maximum ambient temperature (T_{ma}) specified by the manufacturer.
- **Reduced Air Flow** — Installation of the equipment in a rack should be such that the amount of air flow required for safe operation of the equipment is not compromised. Do not block vents.
- **Mechanical Loading** — Mounting of the equipment in the rack should be such that a hazardous condition is not achieved due to uneven mechanical loading.
- **Circuit Overloading** — Consideration should be given to the connection of the equipment to the supply circuit and the effect that overloading of the circuits might have on overcurrent protection and supply wiring. Appropriate consideration of equipment nameplate ratings should be used when addressing this concern.
- **Reliable earthing** — Reliable earthing of rack-mounted equipment should be maintained. Particular attention should be given to supply connections other than direct connections to the branch circuit (for example, use of power strips).

Lithium Battery Replacement

If a battery is supplied in this Avid product it *must* only be replaced by qualified personnel. Contact Avid Customer Support for assistance.

WARNING

Danger of explosion if battery is incorrectly replaced. Replace with only the same or equivalent type recommended by the manufacturer. Dispose of used batteries according to the manufacturer's instructions.

ADVARSEL!

Lithiumbatteri - Eksplosionsfare ved fejlagtig håndtering. Udskiftning må kun ske med batteri af samme fabrikat og type. Levér det brugte batteri tilbage til leverandøren.

ADVARSEL!

Lithiumbatteri - Eksplosjonsfare. Ved utskifting benyttes kun batteri som anbefalt av apparatfabrikanten. Brukt batteri returneres apparatleverandøren.

WARNING

Explosionsfara vid felaktigt batteribyte. Använd samma batterityp eller en ekvivalent typ som rekommenderas av apparattillverkaren. Kassera använt batteri enligt fabrikantens instruktion.

VAROITUS

Paristo voi räjähtää, jos se on virheellisesti asennettu. Vaihda paristo ainoastaan laitevalmistajan suosittelemaan tyyppiin. Hävitä käytetty paristo valmistajan ohjeiden mukaisesti.

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Chapter 1: Introduction

1.1 MI715/MO705

The MI715 and MO705 converters provide MADi conversion to interface to/from analog and AES equipment such as consoles, tape decks, microphone preamplifiers and other devices. Both converters are two rack spaces high and are housed in a stainless steel chassis with machined, heavy aluminum front panels.

The MI715 converts incoming analog signals to 24-bit MADi digital signals that capture the input's complete dynamic range. Each main AES/EBU input is automatically evaluated for sample-rate conversion. The incoming sample rate is compared with the internal rate. If they are the same, no conversion occurs. If the rates differ, sample-rate conversion is activated and persists until a new input is applied or the internal sample rate changes. The sample-rate conversion range is 32–56 kHz. In addition to the 8 XLR connectors for analog inputs and 8 XLR connectors/2 D-Sub connectors for AES inputs. The MO705 converts incoming MADi signals to 8 analog channels and 8 AES stereo pairs. The 16 digital outputs (8 pair) can be bit-depth converted from 24 to 20 or 16 bits.

1.2 Power On Sequence

We recommend powering up the converters only after verifying the presence of a valid sync signal. After powering up the converters, the Sample Rate and Sample Rate Source LEDs blink as the converter senses the incoming Sample Rate source and Sample Rate. We recommend monitoring the power-up sequence to verify the converters have correctly auto-sensed the desired Sample Rate Source and Sample Rate.

1.3 Safety and Precautions

The MI715 and MO705 comply with CE's EN 60950 Electrical Safety Standards.

1.3.1 220, 230, 240 VAC Operation

NOTE: *Before connecting power to the converters, change the fuse and voltage selector to the appropriate 220/230/240 VAC settings.*

The converters preserve their signal quality using linear power supplies that must be manually switched between 115 and 230 VAC. The units are shipped set for 115 VAC. Move the red, two-position switch near the power entry module of the converters to the 230 VAC position (down) for 220/230/240 VAC operation.

Each unit uses a 0.630 A fuse for 115 VAC operation. To operate at 220, 230, or 240 VAC, install the spare 0.315 A fuse provided in the power entry module fuse-holder. To access both the active and the spare fuse:

1. Turn the unit's power off.
2. Remove the IEC power cable from the power entry module.
3. Use a small screwdriver to open the fuse tray below the electrical inlet.

The active fuse is to the rear of the tray. The spare fuse is in the tray slot closest to the front. Pull the fuses through the plastic constriction point that holds them from falling out.

NOTE: *Never disconnect the safety ground to the converters.*

Power Cord Requirements

The converters are supplied with North American IEC power cords. If this cord is changed to allow a different plug configuration, it is the responsibility of the user to select an approved power cord with proper construction material, current capacity, flexibility, and strength characteristics.

Cooling

We strongly recommend providing adequate ventilation to the converters, particularly when installed in a rack. The MI715 and MO705 converters in particular should have space left above and below every two units so heat can properly dissipate

Chapter : MI715/MO705 Converters Features

Professional grade audio conversion is accomplished utilizing 128 times over-sampled noise-shaped delta-sigma techniques. The analog to digital conversion employs a multi-bit modular architecture while the digital to analog conversion employs a single-bit modulator architecture. Low-jitter reference clocks are provided utilizing digital PLL techniques with VCXO and VCO oscillators.

The analog inputs and outputs can be calibrated from the front panel of each unit.

AES/EBU and Word Clock external sync inputs on both units provide synchronization to digital systems. Sample Rate Source and Sample Rate are automatically sensed by both units. Supported sample rates include 44.1, 48, 88.2, and 96 kHz. In addition, pull-up and pull-down rates for the standard sample rates, as well as custom sample rates are available.

. Applications

In addition to their standard use in a Euphonix digital system, the MI715 and MO705 can be used as stand-alone converters. When used with the Euphonix SH612 Studio Hub, this is a powerful conversion and MADI routing system that can be used to interface between an analog console and an otherwise all-digital facility (i.e., TV broadcast facility).

NOTE: MADI cables can be extended to 50 m (164 ft), allowing remote location of the converters.

MI715/MO705 Front Panel

This section discusses both front panels and notes their few differences.

Trim Pots Access: One trim pot adjust the maximum analog input/output level of channels 1–8 in 2-dB steps between +12 and +26 dBu.

Sample Rate LEDs: These LEDs indicate the sample rate to which the converter is currently locked. Sample rates are auto-sensed but can be manually selected on the AM713. Supported sample rates are 96 kHz, 88.2 kHz, 48 kHz, 44.1 kHz, and Custom rates from external sources.

Sample Rate Source LEDs: These LEDs indicate the format of the Sample Rate Source to which the converter is currently locked. Sample Rate Source can be auto-sensed or manually selected. If an external source is not detected, the MI715 reverts to Internal sync; the MO705 mutes its outputs. If a manually selected source is not present, the Sample Rate Source indicator blinks.

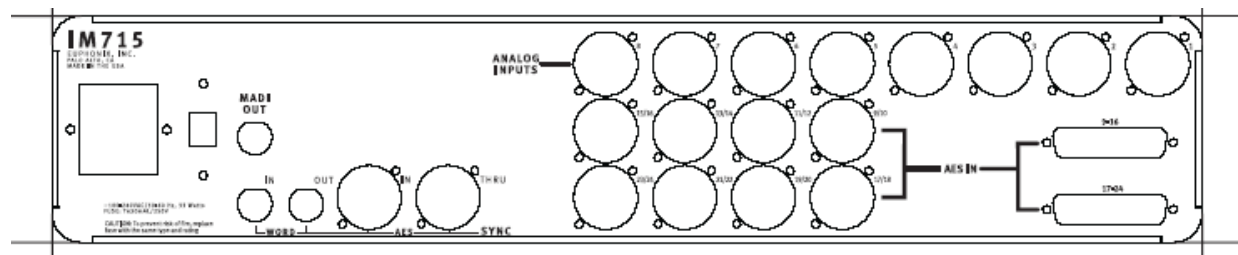
- **AES:** Sample Rate locked to AES Input.
- **Word:** Sample Rate locked to Word Clock Input.
- **Internal** (MI715 only): Sample Rate locked to its own internal crystal.
- **MADI** (MO705 only): Sample Rate locked to MADI.
- **Auto:** Sample Rate Source has been auto-sensed.

These LEDs appear in the same order in which signals are tested for their presence. This detection procedure occurs when the converters are powered on. The Sample Rate (MI715 only) and Sample Rate Source can also be selected manually. **Manual Selection Buttons:** The button below each Sample Rate LED row manually selects the sample rate. The MI715 also allows manual selection of the Sample Rate Source.

Power Switch: On/Off switch.

NOTE: *There are no user-serviceable parts in the converters.*

MI715 Rear Panel



MA715 Rear Panel

Input Voltage Selector: This red switch allows the unit to operate in either 110/115 VAC or 220/230/240 VAC environments. A fuse must also be changed for 220/230/240 VAC operation (see page 5). Units are shipped set and fused for 110/115 VAC.

Power Connector (IEC) and Fuse Tray: The IEC power connector accepts standard IEC power cords. The fuse tray contains both the active fuse and a spare fuse for 220/230/240 VAC operation. See page 6 for instructions on how to change the fuse for 220/230/240 VAC operation.

Analog Inputs (female XLR): 8 balanced, analog inputs on XLR connectors. Input sensitivity is set from the front panel.

AES/EBU Digital Input (female XLR): 8 Stereo AES/EBU digital input on XLR connectors

Parallel AES/EBU Digital Inputs (female DB25): Two 8-channel digital connectors function in parallel with XLR digital inputs, and should not be used simultaneously

AES Sync In (female XLR): Master clock input for the converter when using AES as Sample Rate Source.

AES Sync Thru (male XLR): Outputs the same signal connected to AES Sync In.

Word In (BNC): Master clock input for the converter when using Word Clock as Sample Rate Source.

Word Out (BNC): Outputs a Word clock signal synchronized to the Sample Rate Source. In the presence of an external Word clock input, this connector provides a regenerated version of that input signal. Without an external sample rate source, this connector outputs the internally generated clock signal.

MADI Out (BNC): Outputs the digital audio signal.

- **1–8:** Analog inputs
 - **9–24:** AES inputs
-
-

MA705 Rear Panel

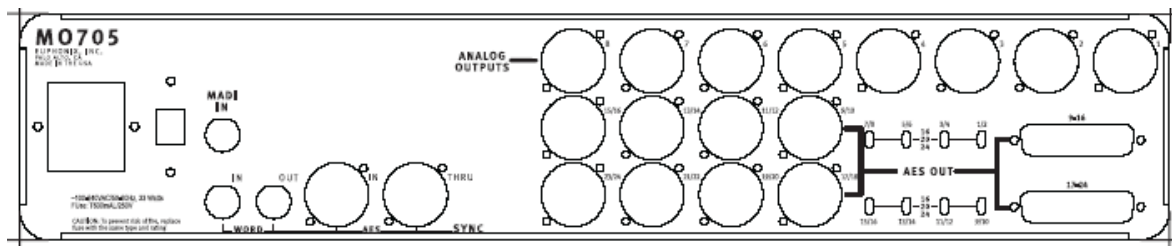


Figure 1-1 MA705 Rear Panel

Input Voltage Selector: This red switch sets the unit to either 110/115 VAC or 220/230/240 VAC environments. A fuse must also be changed for 220/230/240 VAC operation (see page 6). Units are shipped set and fused for 110/115 VAC.

Power Connector (IEC) and Fuse Tray: The IEC power connector accepts standard IEC power cords. The fuse tray contains both the active and spare fuses. See page 6 to learn how to change the fuse for 220/230/240 VAC operation.

Analog Outputs (male XLR): 8 balanced analog outputs on XLR connectors. Output level is set from the front panel.

AES/EBU Digital Outputs (male XLR): 8 Stereo AES/EBU digital outputs on one XLR connector.

Parallel AES/EBU Digital Outputs (female DB25): Two 8-channel digital connectors function in parallel with XLR digital outputs and the two outputs should not be used simultaneously. See Figure 3-5 on page 33 for pinout diagram.

AES Sync In (female XLR): Master clock input for the converter when using AES as the Sample Rate Source.

AES Sync Thru (male XLR): Outputs the same signal connected to AES Sync In.

Word In (BNC): Master clock input for the converter when using Word Clock as Sample Rate Source.

Word Out (BNC): Outputs a Word Clock signal synchronized to the Sample Rate Source. In the presence of an external Word clock input, this connector provides a regenerated version of the input signal. Without an external sample rate source, this connector outputs an internally generated clock signal.

MADI In (BNC): Digital audio signal input.

- **1–8:** analog outputs
- **9–24:** AES outputs

.....Synchronization

.1 MI715

The MI715's Sample Rate is set externally by one of two source signals or internally by crystals and associated circuitry. The Sample Rate Source is determined automatically by the presence of signals when the MI715 is powered on. The order in which external signals are tested for presence is: AES, Word, Internal.

The detected signal immediately becomes the source for the MI715's sample rate clock. The auto-sensed Sample Rate Source can be overridden using the button on the front panel of the MI715, below the Sample Rate Source LEDs. If neither AES nor Word Clock signals are present, the MI715 uses its internal clock derived from on-board voltage-controlled crystal.

The default internal Sample Rate of the MI715 is 48 kHz. This default internal rate can be overridden with the Sample Rate button on the front panel of the MI715 (directly below the Sample Rate LEDs) to 44.1, 48 or 96 kHz.

.2 MO705

The MO705 detects Sample Rate and Sample Rate Source like the MI715 with the following two differences:

- Since the MO705 is always a slave to an external Sample Rate Source, there is no internal Sample Rate setting.
- The MO705 can use MADI in addition to AES or Word Clock as a Sample Rate Source, and detects the presence of these signals in the following order: AES, Word, MADI.

When a signal is detected, it immediately becomes the sample rate clock of the MO705. The auto-sensed Sample Rate Source can be overridden with the Sample Rate Source button on the front panel of the MO705, below the Sample Rate Source LEDs.

2.7 Specifications

MI715 Performance Specifications	
Sync Sources	AES, word clock, internal
Sync Outputs	AES thru and word clock out
Sync Detection	Auto or switched
Internal Sample Rate	44.1, 48, 88.2, 96 kHz ± 50 ppm
Lock range	
fine mode	± 300 ppm
custom mode	$\pm 12\%$ varispeed of 44.1 and 48 kHz Above 50 kHz, varispeed can adjust the nominal sample rate by -12 to +5%
Audio Inputs	8 analog, 16 AES (8 AES Pairs)
Analog Inputs (1–8)	Electronically balanced XLR; 20 k Ω input impedance
Level for 0 dBFS	Adjustable between +12 and +26 dBu in 2-dB steps
Signal-to-Noise Ratio	105 dB (unweighted)
THD	0.0005%
Frequency Response (1 kHz @ +4 dBu)	± 0.25 dB 20 Hz – 20 kHz @ 48 kHz -2.5 dB 20 Hz – 40 kHz @ 96 kHz
CMRR	>50 dB 20 Hz – 20 kHz
Crosstalk	≥ -110 dB @ 1 kHz ≥ -100 dB 20 Hz – 20 kHz
Group Delay	$41.7/F_s$ (869 μ s @ 48 kHz)
AES Inputs (9-24)	XLR, transformer isolated, 110 Ω , 24-bit Group delay varies with sync frequency and inputs
MADI Output	BNC 75 Ω 24 channels at all sample rates Inputs mapped to channels 1–24, 24-bit signal path

MO705 Performance Specifications	
Sync Sources	AES, word clock, MADI
Sync Outputs	AES thru and word clock out
Sync Detection	Auto or switched
Internal Sample Rate	44.1, 48, 88.2, 96 kHz ± 50 ppm
Lock range	
fine mode	± 300 ppm
custom mode	$\pm 12\%$ varispeed of 44.1 and 48 kHz Above 50 kHz, varispeed can adjust the nominal sample rate by -12 to +5%
MADI Input	BNC 75 Ω 44.1/48 kHz: 56 channels 88.2/96 kHz: 28 channels. Outputs mapped to channels 1–24, 24-bit signal path
Audio Outputs	8 analog, 16 AES
Analog Outputs (1–8)	Electronically balanced XLR; 200 Ω output impedance
Level for 0 dBFS	Adjustable between +12 and +26 dBu in 2-dB steps
Signal-to-Noise Ratio	101 dB (unweighted)
THD	0.0003%
Frequency Response (1 kHz @ +4 dBu)	± 0.25 dB 20 Hz – 20 kHz @ 48 kHz -2.5 dB 20 Hz – 40 kHz @ 96 kHz
CMRR	>50 dB 20 Hz – 20 kHz
Crosstalk	≥ -110 dB @ 1 kHz ≥ -100 dB 20 Hz – 20 kHz
Group Delay	$28.2/F_s$ (588 μ s @ 48 kHz)
AES Outputs (9–24)	AES on XLR, transformer isolated, 110 Ω , 24 bit User can truncate to 16- or 20-bit per stereo pair
Truncation Type	Dithered or 1 st order noise-shaped, internally switched
Dither Type	TPDF (active only for 16- or 20-bit word length)
Digital Format	Pro or Consumer, internally switched
Group Delay	$3/F_s$ (63 μ s @ 48 kHz)
	AES (XLR), transformer isolated, 110 Ω
Digital Format	professional or consumer (internally switched)

IM715/MO705 Technical Specifications	
Power Requirements	100–240 VAC or 240 VAC; 50/60 Hz
Power Consumption	100 W
Temperature of Operation	5–35°C
Dimensions	Height: 3.5 in; Width: 19 in; Depth: 18.25 in; Weight: 17 lb

In the interest of continued product development, Euphonix reserves the right to make improvements in this manual and the product it describes at any time, without notice or obligation.

System 5, S5, PatchNet, eMix, EuCon, R1, Studio Hub, Audio Deck, Max Air, Reel Feel, Clear Displays, Track Panner, SnapShot Recal, DSC (Digital Studio Controller), Hyper-Surround, Total Automation and Mix View are trademarks of Euphonix, Inc.

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Manual written by Jay Spears and Eddie Jones

Note: *This equipment has been tested and found to comply with the limits for a Class A digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.*

Caution: *Any changes or modifications made by the user that are not expressly approved by Euphonix could void the user's right to operate the equipment.*
